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ABSTRACT

Developmental differences in two components of allocation of study time were examined: (1) allocating more time to more difficult material (that is, differential allocation) and (2) allocating sufficient time to meet the recall goal (sufficient allocation). In order to make the task simple enough for young children, "easy" and "hard" booklets of, respectively, highly related and unrelated paired-associate line drawings were used. A total of 128 children in grades 1, 3, 5, and 7 were asked to study one easy and one hard booklet of paired-associate items within the context of a self-terminated study procedure. Following two self-terminated trials, children were asked questions to assess their knowledge related to allocating study time. Results revealed that while children in grades 1 and 3 spent approximately the same amount of time on hard pairs as easy pairs, children in grades 5 and 7 spent a greater amount of time on hard pairs than easy pairs. Age-related improvement was found in allocation of sufficient time, as evidenced by increased recall scores in higher grades, along with an increase in the number of children who actually met the recall goal; however, many, including the older children, were not entirely successful at meeting the recall goal. It is concluded that observed age-related differences in aspects of metacognition may account, in part, for the developmental differences in allocation of study time. (RH)

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Children's Spontaneous Allocation of Study Time in a Paired-Associate Task

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Summary

The present study was conducted to examine how children spontaneously allocate study time in a relatively simple study situation. Effective apportionment of study time is useful in everyday learning situations as children frequently have to make decisions regarding how to distribute study time among different units of material (differential allocation), and how much time to spend studying to meet the study goal (sufficient allocation). Despite the importance of the ability to utilize study time strategically, the topic has not received sufficient attention.

The research that is available on differential allocation of time provides little information with regard to how children spontaneously distribute study time (e.g., Kail, 1984). Although several researchers (e.g., Brown & Smiley, 1978; Owings, Petersen, Bransford, Morris, & Stein, 1980) were concerned with spontaneous aspects of allocation of study time, they used complex text material that younger children might have found too difficult. A study by Masur, McIntyre, & Flavell (1973) using simpler materials revealed that grade 3 children were more likely than grade 1 children in multi-trial free recall situations to focus in later trials on previously unrecalled items. But since these researchers forced children to select only one-half of the items for further study, we do not know how children would behave in a more spontaneous situation. With regard to sufficient allocation of study time, Flavell, Friedrichs, & Hoyt (1970) concluded that 7-year-old children were able to monitor their recall readiness accurately when the length of serial-recall lists was equal to children's

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immediate memory span. Subsequent researchers (e.g., Leal, Crays, Moely, 1985) have shown that children older than grade 2 may still have difficulty regulating study time by assessing the progress of learning. It should be useful to determine the generality of the Flavell et al. findings by using a different recall list (i.e., paired-associate) that is greater than children's memory span.

The following questions, then, provided the major focus of the present study: (1) Do children spontaneously allocate more study time to hard units than to easy units of material? (2) Do children spend a sufficient amount of study time to ensure that the recall goal can be met?

Method

One hundred and twenty-eight children in grades 1, 3, 5, and 7 were interviewed individually. The materials consisted of two types of booklets of paired-associate line drawings: "easy" booklets, made up of highly related items (e.g., bat-ball); and "hard" booklets, made up of unrelated items (e.g., book-frog). To make the "hard" task approximately equally difficult for all age levels (approximately equal trials-to-criterion under a standard study-test method of presentation), and to maintain a distinct difference in difficulty between easy and hard tasks at all age levels, the number of items in a booklet was varied. On the basis of pilot work, the number of pairs in each booklet was set at 5, 6, 7, and 8 pairs for grades 1, 3, 5, and 7, respectively. Our pilot study also confirmed that the related items were indeed easier to learn for all children and that the hard pairs could be learned with some reasonable effort (four trials). Test booklets were constructed by placing only the stimulus item on the left half of the card, with the right half remaining blank.

Following a practice trial, the children were presented with two booklets (one easy and one hard), asked to name the picture-pairs, and told to study

the items until they were sure they could recall all the "partners" perfectly (self-terminated procedure).[1] This was followed by a recall test. The same self-terminated study procedure was then repeated for trial 2 using two new booklets, one easy and one hard. Following the second trial, children were asked questions to assess their knowledge of how to allocate study time differentially (e.g., which booklet will be easier to remember, how they should study so they can remember the hard and the easy booklet well) and sufficiently (e.g., knowledge of self-testing strategies). A third self-terminated trial was then administered to provide preliminary information regarding the limits of children's ability to allocate study time strategically. The sessions were videotaped in order to measure children's study times, and to assess study behaviors (e.g., self-testing strategies).

Results and Discussion

The mean study times for easy and hard pairs are presented in Table 1. Although the data from trials 1 and 2 are most relevant to children's spontaneous allocation of differentiated study time (Question 1), a comparison of study times for easy as opposed to hard items revealed similar results over all three trials. While grades 5 and 7 children allocated more study time to the hard pairs than to the easy pairs, grades 1 and 3 children allocated approximately the same amount of time to both types of items. By the second trial, only 20% of younger (grades 1 and 3) students allocated a higher proportion (60% or more) of their study time to hard pairs, while 75% of the older (grades 5 and 7) students

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[1]One-half of the children (prompt group) were asked to identify which booklet would be easier to learn, after naming the pairs but before studying them. The prompt condition was included to activate children's awareness of the difference in difficulty of the items. This prompt had no effect on differential or sufficient allocation of study time. Therefore, the data were collapsed across this variable.

studied in this manner. While the same pattern of differential allocation was observed over trials, grades 3 and 7 students showed higher total study time on trial 3 than on trial 1, whereas grades 1 and 5 students expended a comparable amount of study time across trials.

Recall data are relevant to the issue of sufficient allocation (Question 2). Analyses of the recall scores (see Table 2) indicated that grades 5 and 7 children recalled significantly more hard items than grades 1 and 3 children did. Although significantly more of the grade 7 as compared to grades 1 or 3 children recalled all items perfectly by the second trial (see Table 2), the number of children who met this recall goal was rather small even at grade 7 (25%). A related question was the type of strategies children of different ages used to assess whether they had studied enough. The number of children in each grade using a self-testing strategy for paired-associate items (covering response item and trying to guess response) and a general self-testing strategy (e.g., cumulative rehearsal) is set out in Table 3. Although the use of any type of self-testing strategy was infrequent in grades 1 and 3 children, it was more common in older children, especially following a partial demonstration by the experimenter of such a strategy (during the metamemory questions). Thus, both the recall data and self-testing data revealed age-related improvement in allocation of sufficient time, although even in the older grades many children were not completely successful at this.

An assessment of children's metamemory knowledge revealed a similar pattern of age-related differences. For example, with respect to knowledge relevant to differential allocation, the percentages of children who knew that the unrelated pairs are more difficult to learn and that the harder booklet should be studied longer (or with elaboration strategies) increased with age: 31%, 63%, 88%, and 97% for grades 1, 3, 5, and 7, respectively. With respect to knowledge of

self-testing strategies, very few of the children in grades 1 and 3 could suggest the use of self-testing strategies to ensure the items could be recalled perfectly, while the majority (80%) of grades 5 and 7 children were able to suggest some type of self-testing strategy.

Effective allocation of study time in the present task involves regulating study activities in accordance with: (a) knowledge that the unrelated pairs are more difficult to learn, and/or (b) information about the current state of memory (e.g., I am not learning this book well). Information from a and/or b (above) is relevant to allocating study time differentially, while information from b is most relevant to sufficient allocation. Interview and observational data revealed age-related differences in the above aspects of metacognition, although knowledge of how to use self-testing strategies to monitor the current state of memory appears somewhat later than knowledge of the difference in task difficulty or knowledge that the hard booklet should be studied longer than the easy booklet. The above interview and observational data, as well as the finding that more of the children were able to allocate time differentially as compared to sufficiently, suggest the following conclusion: When children begin to allocate time strategically, they first use information about the task or the materials to allocate time (e.g., this booklet is much harder so I should study this one much longer), and only later do they begin to also use information about the current state of their memory to regulate study activities.

Table 1.

Mean Study Time (in seconds) per Pair for Easy and Hard Booklets.

		Grade 1	Grade 3	Grade 5	Grade 7
Trial					
1	Study Time - Easy	5.42	4.43	4.54	4.25
	Study Time - Hard	4.99	5.50	7.64	10.63
2	Study Time - Easy	5.09	4.71	3.81	4.16
	Study Time - Hard	4.94	5.38	8.10	12.82
3	Study Time - Easy	5.69	7.45	4.35	4.94
	Study Time - Hard	5.72	10.01	9.51	14.00

Table 2.

Mean Proportion of Correct Responses for Easy and Hard Items, and Percentage of Children who Recalled all Items Perfectly.

		Grade 1	Grade 3	Grade 5	Grade 7
Trial					
1	Recall - Easy	.96	.98	1.00	1.00
	Recall - Hard	.48	.46	.63	.68
	% of Children with Perfect Recall	12%	6%	9%	19%
2	Recall - Easy	.96	.98	.99	.98
	Recall - Hard	.53	.56	.67	.71
	% of Children with Perfect Recall	3%	3%	16%	25%
3	Recall - Easy	.96	.98	.98	.99
	Recall - Hard	.55	.56	.76	.82
	% of Children with Perfect Recall	6%	3%	28%	50%

Table 3.

Number of Children Using Self-Testing Strategies Spontaneously (Trial 1 or 2) and After Partial Demonstration of a Self-Testing Strategy (Trial 3)

	Spontaneous Use		Use After Demonstration	
	Self-Testing for P-A items	General Self-Testing	Self-Testing for P-A items	General Self-Testing
Grade				
1	0	0	1 (1)*	0
3	0	3	6 (4)*	0
5	7	5	14 (0)*	2
7	6	3	13 (0)*	1

* Number in brackets indicates the number of children who used the strategy of looking at the stimulus and response picture, then immediately covering the response and trying to guess the response.

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